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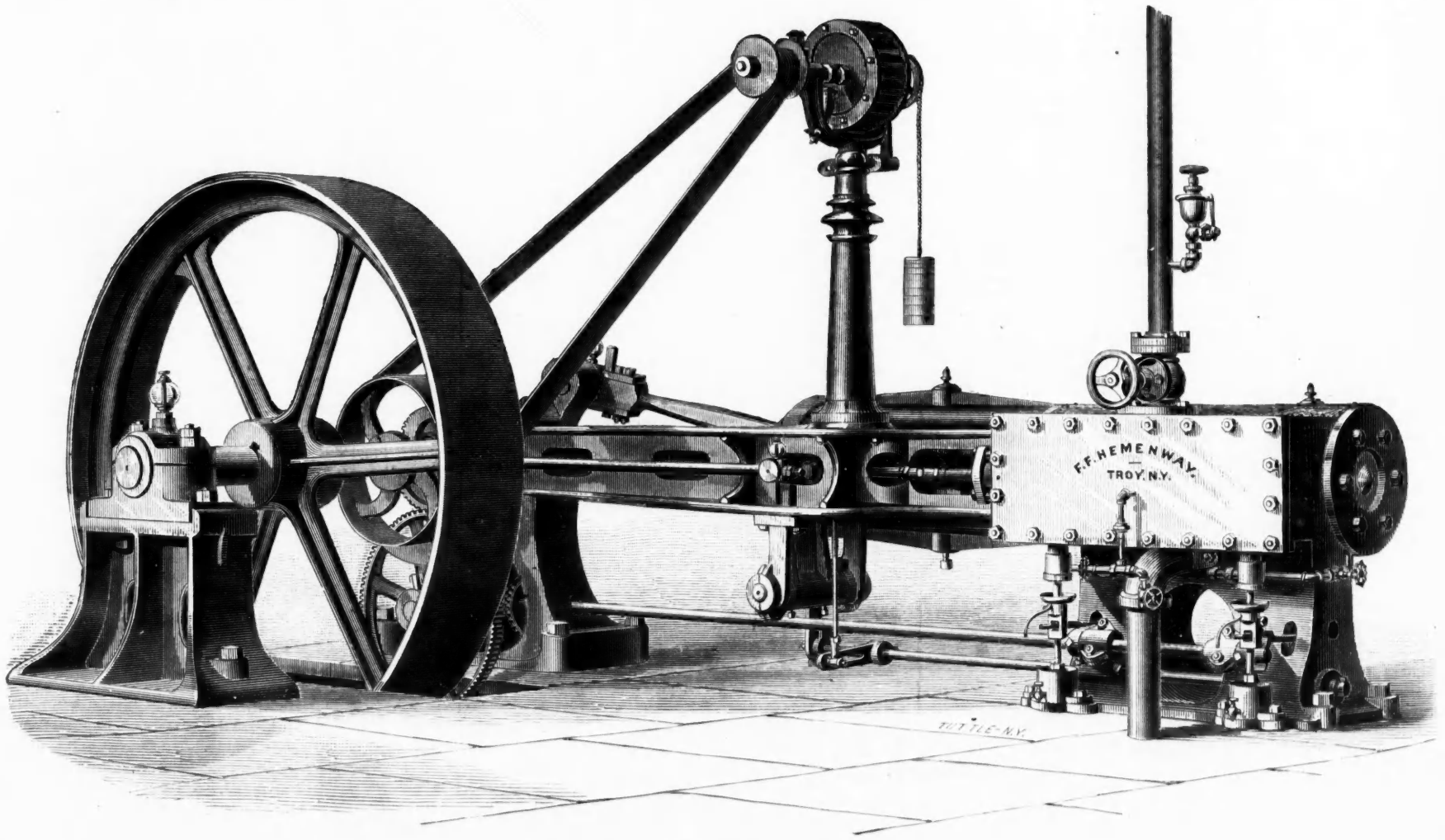
The Hemenway Automatic Cut-off Engine.

The engine shown in the engraving upon this page is the result of exercising a little theory and a great deal of practice. It was first built to supply a local trade, but as its true merits have become known it has been supplied to furnish power in more remote localities. This engine has apparently the much-abused girder frame, but has in reality a modification of the same.

It consists essentially of a rectangular box, strengthened by two lateral ribs or flanges, designed to give not only lateral strength but stability in a direction towards and from the foundation, with little inclination to distortion from springing. The cut-off is of the type in which the suppression is brought about through the operation of supplementary valves, in connection with a ported main slide. The main slide, which is balanced, operates as an exhaust valve; or rather as two exhaust valves, and controls the steam lead. The cut-off valves have a motion across the travel of main slide, but instead of working directly on the back of that valve, they work on thin plates of peculiar construction, which plates are free to move in a direction to or from the main slide, but are restrained from moving in any other direction. The cut-off valves are opened by the operation of revolving steel cams, the working faces of which are of a parabolic form, terminating in an abrupt jog, by which the cut-off levers (carrying with them the cut-off valves) drop in closing. The cut-off valves having to drop but $\frac{1}{8}$ths of an inch in closing (and then gravity being assisted by the pressure of steam against the area of the valve stem) the closing is all that could be desired. The construction of these valves is such as to entirely relieve them from pressure to their seats while opening and closing, reducing the wear of cams to a minimum. In point of fact, the wear is inappreciable after a year of constant use. The cut-off has a range of 0 to $\frac{7}{8}$ of stroke, and having no duty to perform except that of suppression, may have any amount of lead—always well in advance of main valve. This feature coupled with the fact that there is no hook-on motion, and hence no possibility of a failure to lift, enables the engine to run at any desired speed, since the cut-off valves may, if necessary, begin to close at the beginning of the stroke, or at any point later, without in the least affecting their operation. The cut-off side of cam, being subject to no wear whatever, will maintain its adjustment indefinitely, while the precise time at which the cut-off commences to open being a matter of perfect indifference, it follows that the necessity for refined adjustment to compensate for wear and other contingencies is entirely obviated. Hammered steel is used for the moving parts, such as the crank shaft, connecting rod and straps. Another feature is the entire absence of packed joints, every joint, including steam-chest cover and flange at the outer end of throttle valve, being scraped to steam-tight contact. Simplicity of construction has been the aim in designing this engine; also ample wearing surfaces and ready means of adjustment, as well as the economical use of steam. An experimental engine of this class has been run for two and one-half years at 240 revolutions per minute. Thus far patterns have been prepared for cylinders from $6\frac{3}{8}$″ to 16″ in diameter with strokes ranging from 12″ to 42″. These engines are built under the direct supervision of the designer, F. F. Hemenway, 441 10th St., Troy, N. Y., well known to readers of the AMERICAN MACHINIST as a frequent and valuable contributor to its columns.



THE HEMENWAY AUTOMATIC CUT-OFF ENGINE.

Steam-Fitting Contingencies.

BY WM. J. BALDWIN.

Any steam-fitter's helper, or boy about a machine shop, can cut a thread on a piece of pipe with an ordinary stock and die, but he cuts two crooked threads to the one he cuts straight; and the straight thread is only straight enough not to have the fitter comment on it, in language more forcible than elegant.

Most men wish to do their work well, and the steam fitter is not an exception to the general rule; but the nature of his tools and materials is such, he cannot always help himself. He is furnished a kit of tools by the shop, with fittings, and pipe. The tools are old; the fittings are not always tapped straight, and the pipe will sometimes run a little under the gauge—which is not so bad, and now and then runs over the standard, which is very bad for the fitter. Now, with all the above drawbacks, he *can* make straight work—that is, work which is considered to be straight, to have its angles right angles, to be parallel, to be plumb; in fact, to conform to the general good appearance of the house it is in, the work it connects, and its own parts.

Now, there are three ways of getting straight work. The first by using straight threads on the pipe, and straight fittings; the second, by the use of straight fittings and crooked threads, and the third, by using crooked fittings and crooked threads. The two latter require some explanation, but we will consider the subject from the standpoint of the steam fitter. The intelligent machinist, who is called upon to do some pipe fitting, readily seeing the analogy, may amplify the principle and apply it as he can.

If a fitter is running a coil around a room, and has a corner to turn—the corner being a right angle, and his pipe and thread straight—all he has to do is to put it up (assuming that he knows the use of the tools, and something about pipe and fittings), and it will be a good job. But if he finds his elbows are *slightly acute*—less than

a right angle, what will he do? Get other elbows? That will take too much time. Bend or kink the pipe near the end? That looks badly. Put it up as it is, and spring the pipe back to the wall? Oh, no! Use crooked threads on the pipes? That is very well; but you cannot always get just the crook you want. Well, then, *get more crook than you want.* How? I will show you.

Select as many short pieces of pipe as you have elbows in that particular corner; it is much easier to handle and enter a short piece when it has a crooked thread and wabbles. Then proceed in the ordinary way to cut crooked threads on the end of each piece which is to enter the elbow, being sure to make the thread as crooked as the corner will require; but if it is *more* than the corner actually demands, it will make no matter. Oh! you put in the 1¼″ guide and trust to chance for the kind of a thread you get? Yes. That will not do; you will have to try too often in that way, and have too much waste. Now for a better way. You are going to cut a crooked thread on a one inch pipe—so you take the next size larger guide and put it in the stock; but, as you attempt to cut the thread, you cannot tell which side of the pipe it may catch on, as the die wabbles every way. Therefore, get a pine chip, and cut it into a wedge, and slip it between the guide and the pipe; but that brings it *too far* over, the guide being too large. Make another wedge, and put it in the opposite side to the first one; but not too far. Now wrap that piece of wire around the wedges, and give it a twist with the pliers. This will keep the wedges in their places, for should they move around the pipe with the stock and die, you cannot get a crooked thread—nor any thread. You will simply grind the end off the pipe. There! Soon you have the full number of pieces with crooked threads on them; and though all the threads are not exactly alike, we will make them fit the corner without bending, nevertheless.

Now, we said our corner was a right angle in this case, and that our fittings were *out—i. e.*, not as they should be, so we will make a diagram (see Fig. 1), in which the shaded lines *a b*, and *b c*, are the corner, and *d*, the to pipe of the coil, with an elbow screwed on with the hand only, the pipe *e*, showing the position a straight line would take, if screwed with an elbow slightly acute. Now, the first crooked-threaded pipe we pick up is crooked a little more than is actually sufficient; but, as kinking a pipe to straighten it is as bad as kinking it to crook it, we will try another plan, which we will represent and explain by diagram (Fig. 2.) In this case, the elbow may be a little out of square, or the room may be a little out; it don't matter either or both, as we wish to show all we can what may be accomplished by the crooked thread. Now, if the pipe *e*, has a crooked thread screwed into the elbow, and the pipe *d*, is the straight pipe, hold the pipe *e*, in such a manner by suitable hook or ring plates, that it cannot move, except to revolve, and the pipe *d*, in such a way that it is free to move in any direction, except revolve on its own axis, or around the axis of *e*. Now revolve *e*, with its crooked thread, and as it cannot change its own axis, it will make *d* move towards or away from the wall, making alternately an acute and an obtuse angle, the limit of either of which will be regulated by the crook; but it will also form any angle between the greatest obtuse and the smallest acute. By stopping the revolution of *e*, when *d* is parallel to the wall, you can then mark the position the pipes bear to the elbow, and screw them up firmly, being sure to stop at the position marked.

It will be seen, although we started with an acute angle, and a right-angle corner, that it would be just as well to start with a right-angled elbow and an obtuse corner, and that as long as the two pipes can be turned in the elbow, it matters not if both pipes, the elbow and the corner are a little out, as the pipe *can* be made to fit the corner. This applies to any other pipe, as well as the coil which has been used as an illustration.

In a pipe carried straight along with a tee in it for a branch, the branch can always be made a right angle to the direct line of the main, by using a crooked thread on the pipe, whether the fitting is tapped at right angles

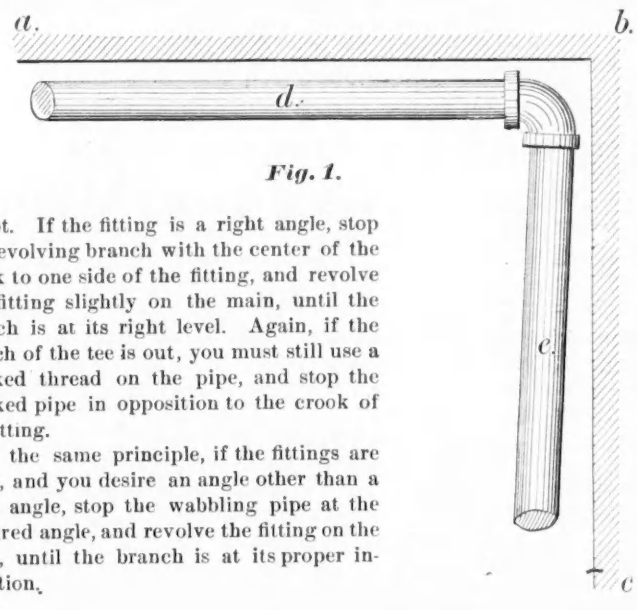


Fig. 1.

or not. If the fitting is a right angle, stop the revolving branch with the center of the crook to one side of the fitting, and revolve the fitting slightly on the main, until the branch is at its right level. Again, if the branch of the tee is out, you must still use a crooked thread on the pipe, and stop the crooked pipe in opposition to the crook of the fitting.

On the same principle, if the fittings are right, and you desire an angle other than a right angle, stop the wabbling pipe at the required angle, and revolve the fitting on the main, until the branch is at its proper inclination.

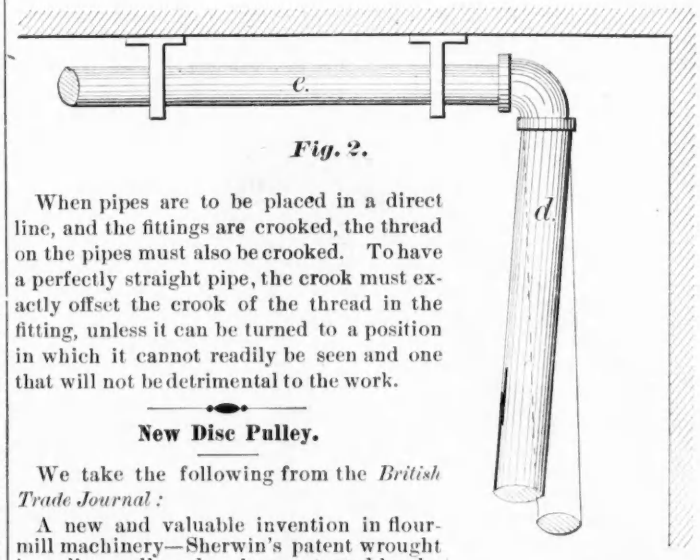


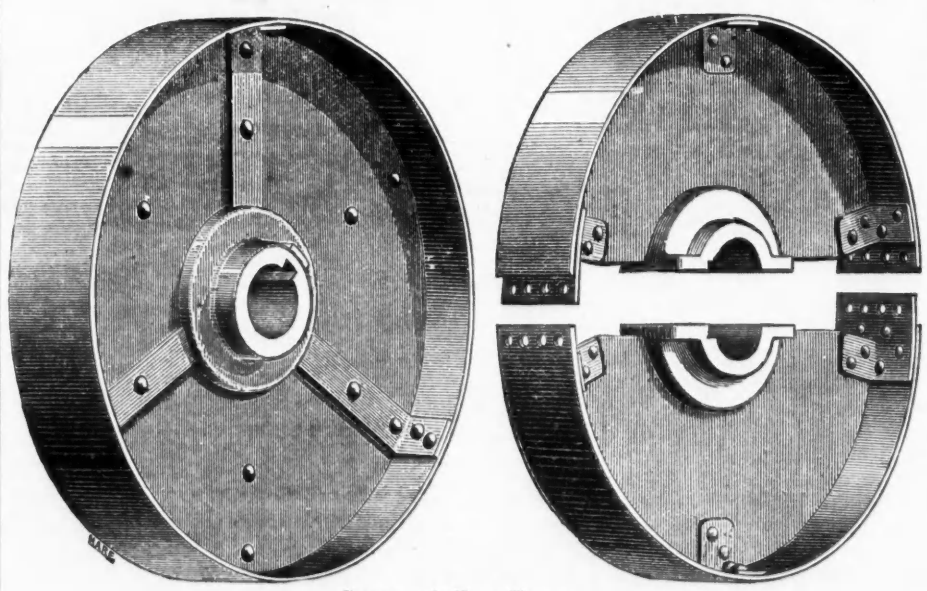
Fig. 2.

When pipes are to be placed in a direct line, and the fittings are crooked, the thread on the pipes must also be crooked. To have a perfectly straight pipe, the crook must exactly offset the crook of the thread in the fitting, unless it can be turned to a position in which it cannot readily be seen and one that will not be detrimental to the work.

New Disc Pulley.

We take the following from the *British Trade Journal:*

A new and valuable invention in flour-mill machinery—Sherwin's patent wrought iron disc pulley—has been patented by the maker, Mr. George E. Sherwin, of the Beach Street Works, Birmingham. Although this contrivance is a novel and advantageous departure from the ordinary construction of pulleys, it is well known that wrought iron pulleys, with arms, have been made for several years. These, however, have failed to secure anything approaching general favor, which is attributable to the serious defect of the periphery or face invariably running considerably out of truth. In the disc pulley under notice, this defect is entirely removed, the outside edge of the disc having been turned true in a lathe before the periphery is put on. The result of this is, that the periphery fits on the turned disc, and causes the face of the pulley to run, for all practical purposes, quite as true as a turned cast-iron appliance. The first illustration shows the entire pulley, which is remarkably strong, this strength having been secured with a minimum amount of material, consequent upon its peculiar construction. Unfortunately, many serious accidents—some resulting in loss of life—have occurred in consequence of workmen engaged in arranging a belt having become entangled in the arms of common pulleys. Artisans have occasionally, by misadventure, lost a limb or sustained permanent injuries, totally or partially incapacitating them during the rest of their lives; such disasters, it is satisfactory to know, are rendered simply impossible where the disc pulley is adopted, there being no arms to cause the danger. The absence of arms also dispenses with the resistance they offer to the air whilst revolving, while another advantage in the invention is that it is evenly balanced, a valuable feature in all machinery, especially that running at high speed. One of the principal advantages which recommends this pulley to colonists and residents abroad is its light weight, which reduces freight charges, and the certainty of the contrivance reaching its destination in good condition, as it cannot fairly be broken in transit, being made of wrought iron. The second engraving represents the split pulley, which is particularly convenient for fixing on shafts to which other pulleys are already secured, thus avoiding delays. For other purposes the patentee recommends the adoption of solid pulleys, as they are stronger than those made in halves. The extremely simple construction of Mr. Sherwin's invention renders it exceptionally well adapted for use in flour mills, not only on the shafting for driving the various machines, but also on the machines themselves. To illustrate this fact the elevator may be mentioned. When the bottom head of an elevator is filled with flour or other material, a considerable resistance is offered to pulleys with arms, but very little, if any, would be made to a disc pulley. Mr. Sherwin has, we remark, kept one essential point in view, that of moderate price, for by employing machinery which he has designed and constructed especially for manufacturing these disc pulleys, and also by making them in large quantities, he is enabled to dispose of them on the same terms as ordinary cast-iron appliances. Novelties in mechanism tending to effect useful purposes, to secure economy, and, above all, to lessen risk to human life and limb, are most welcome innovations.

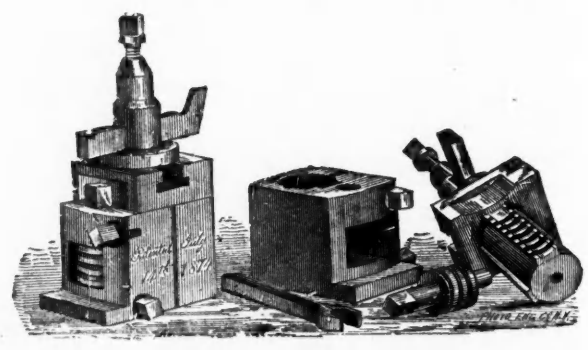


SHERWIN'S DISC PULLEY.

Improved Tool Post for Turning Lathes.

Experienced mechanics and amateurs well understand the difficulties attending the adjusting of a tool to the proper height, so as to cut the material to be operated upon both easily and economically. In the tool posts attached to most lathes, to accomplish the desired end it is necessary to loosen the tool, then tighten it in order to determine its proper position. The consequence is that several adjustments have to be made before a satisfactory adjustment is made. Some tool posts are pivoted, or move upon a rounding surface. In such cases a tool is required to have a large clearance, otherwise the heel will interfere with the cutting edge.

The device herewith represented combines simplicity, durability, firmness, and is easily made. The parts have been designed with a view of facilitating the adjustment, and producing the most satisfactory results at a nominal cost. In the engraving, Fig. 1 shows the tool post complete, while Fig. 2 represents the details.



IMPROVED TOOL POST.

It will be observed that teeth have been cut upon the lower part of the tool post, to which a worm is fitted. By turning the worm with a wrench, the tool post may be readily adjusted to any desired position, the post being prevented from turning, by a feather upon the side moving in a groove. All the parts, after being adjusted, can be quickly locked by the small bolts shown for that purpose, and may be adjusted to compensate for wear. The worm in practice is covered, likewise all the other parts, to protect them from chips and dirt, the cover being removed as illustrated, to show the internal construction. All the parts are made interchangeable. The worm and rack are made of best wrought iron and case-hardened, so that the wear will be very slight.

The motion is quick, and it is claimed that the tool can be raised or lowered while cutting a light or heavy chip without danger of gouging.

This tool post is the invention of Thomas Bonner, Chicopee, Mass.

Babbitt or White Metals for Lining Journal Boxes.

No. 3. 1 pound antimony and 10 pounds lead melted together. No. 2. Melt together equal parts tin and antimony—this makes the hardening. For use, melt together 1 pound of this hardening with 5 or 6 pounds of lead.

No. 1 is composed of 4 pounds of copper, 8 pounds of antimony and 96 of tin. Most machinists are under the impression that this last formula is difficult to follow, in consequence of requiring the use of copper. The copper cannot be melted by itself in anything short of a brass-founder's crucible. By the following process the metal

may be made in an ordinary wrought or cast iron ladle, over a forge fire. First melt the tin, then add the copper; raise the heat to a very low red; stir the copper about with a poker, and in a few minutes it will dissolve like a lump of sugar in tea. Then add the antimony, stir and pour out into moulds.

Fish's Improved Air Compressor.

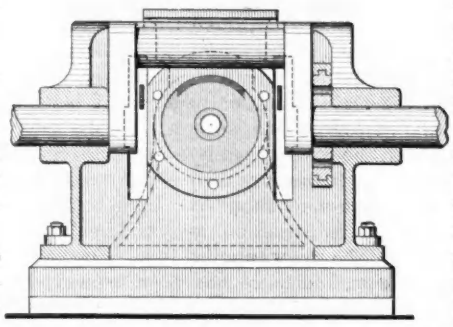
The accompanying engraving represents a new and improved air compressor, which combines some very desirable features, of essential importance in the class of machinery mentioned.

The air cylinder, as shown, is bolted to the air valve chamber, and is cast to the distance piece, which forms the main cross head guides. The distance piece and guides are attached centrally to the steam cylinder, by means of bolts.

Due consideration has been given to the valves for the admission and outlet of the air into and from the cylinder, and from the manner in which these valves are constructed, no possible danger can arise from their being drawn into the cylinder and wrecking the machine in consequence, a mishap that is of frequent occurrence. The area of the air outlet valves is also made with an extra large discharge opening, so that the engine can be run at a high speed, for which it is peculiarly adapted, without detracting from the efficiency of the stroke of the air cylinder, an evil which is very plainly seen when an indicator is applied, to show behavior of the air in the cylinder during compression.

The cooling of the air during compression is accomplished by means of a water jacket, which entirely surrounds the air cylinder proper. When factories are run in climates where the air is naturally dry, it has been found that a certain amount of humidity in the air is very desirable to spin and weave fabrics successfully. This demand may be supplied by attaching a spray injector to this air cylinder, so that air for ventilation of any degree of temperature and humidity can be furnished as desired.

The general construction and arrangement of the parts of this air compressor are entirely different from most machines of this class heretofore made. The bed plate is entirely dispensed with, thus saving about 40 per cent. in the weight of the machine, and the different parts, where attached together, are fitted by turning and boring. A great advantage arises from this in mountainous mining regions, where this class of machinery is being largely used. The machine can be shipped, having all the parts separate, as the air cylinder, distance guide piece, steam cylinder, pillow block, shaft and fly wheel, each piece being of a comparatively small weight. Having arrived at its destination, it can be easily assembled together, without any danger of a mistake. Another feature in the design of this machine is the manner of transmitting the power from the cross head through the



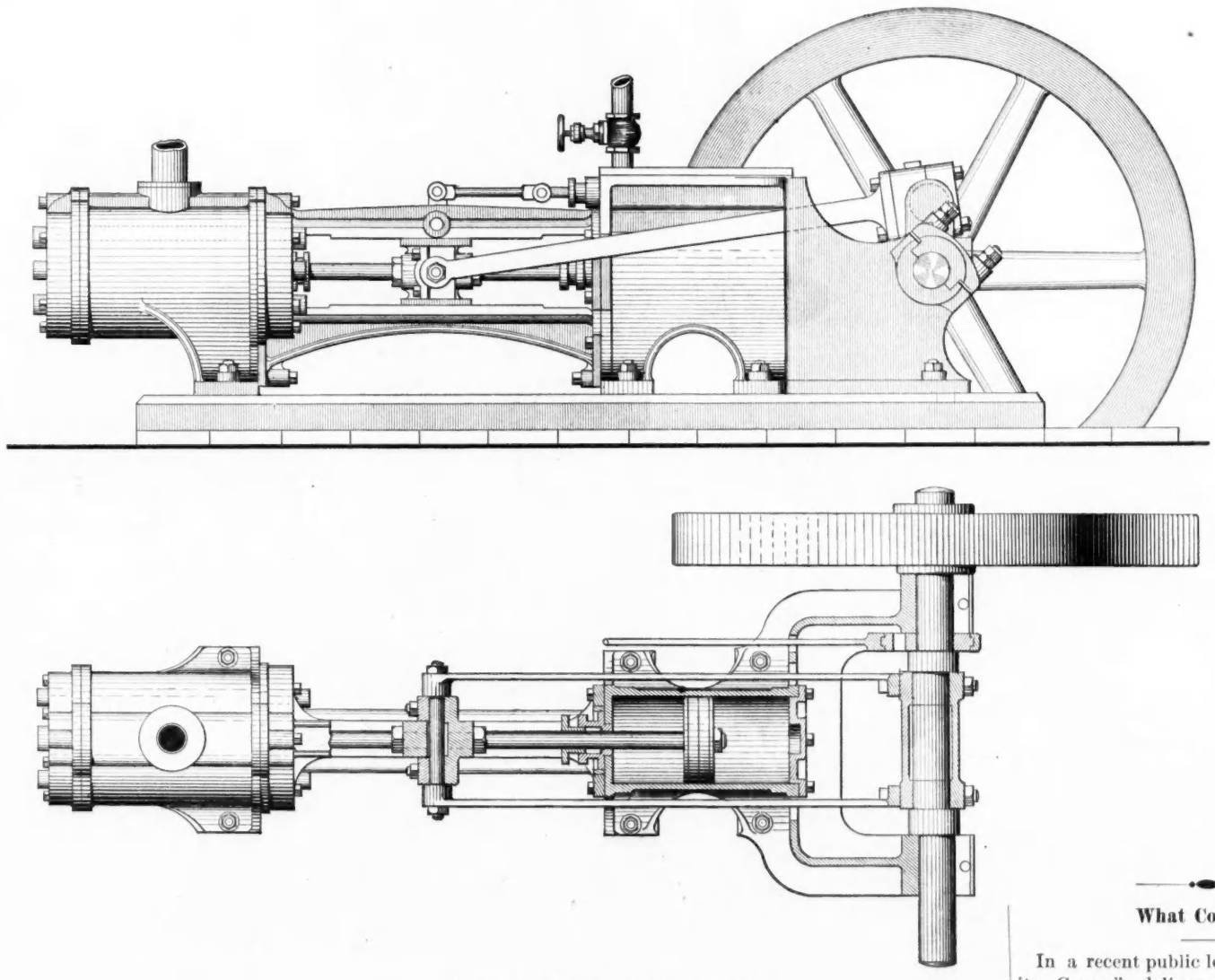
End View.

connecting rod to the crank shaft. The connecting rod is formed of two bars working outside of the steam cylinder, and connected rigidly at one end to a single pin working in the cross head, while the opposite end connects with a single journal box working on the crank pin. By this construction the connecting rod acts like a single rod, for, when the wear is taken up at either end the rod is always kept square with its bearings. Where two separate rods are used, as is usually the case in this style of machine, in taking up the wear in the separate journals, the rods cannot without great difficulty be kept of the same length, and consequently a serious side strain is thrown upon the piston rod, which is fatal to the successful working of the machine.

The checks of the crank are separated a sufficient distance apart, so as to allow access to the steam piston, and the piston and its rod can be removed from the cylinder, without disturbing the crank shaft. The distance between the checks of the cranks is such as to allow the piston and its rod to pass between them, for the reason that the shaft can be brought quite close to the end of the cylinder, leaving just sufficient room for the crank to pass. The advantages of this arrangement are these: a compressor is secured that is self-contained, it does not require an expensive foundation, and also dispenses with heavy bed plates, while an extra long connecting rod can be applied. The whole machine is light, strong and accessible in all its parts, and 40 per cent. shorter in its length than any other machine of the same stroke and length of connecting rod, and is calculated to run at a high rate of speed.

This style of compressor can be furnished, either single or duplex. It often occurs that a single compressor can furnish all the air needed to begin operations with, and as progress is made more air is required. In such cases, these machines are designed so that they can have their shafts coupled together, and being self-contained, very little foundation is required to hold them. On this general design a very simple, light, and compact air compressor can be made, which may be driven by a belt or gearing, and is admirably adopted for cotton factories, breweries, and other places, where compressed air is becoming a desideratum. For mining operations, a very safe and efficient duplex air-compressor engine, with hoisting drum combined, can be furnished, so that hoisting ores and compressing air can go on at the same time, or each can be in operation independent of the other. This makes a very complete and serviceable machine, more especially where it is desired to start operations on a limited scale.

This machine is now being offered to the manufacturing public by the inventor, John Fish, No. 8 Pine street, New York, who has endeavored to combine in one machine all the latest and most desirable improvements. The long experience of the inventor with compressed air has afforded him superior advantages in designing machines of this type.



Fish's Improved Air Compressor.

Our Pig Iron Production.

An interesting and valuable table of the production of pig iron in the United States in 1880, compiled by Mr. James M. Swank, Secretary of the American Iron and Steel Association, appears in the *Bulletin* of Feb. 23. We make the following extracts from the comments accompanying the table:

The production of pig iron in the United States in 1880 was 4,295,414 net tons, or, 3,835,191 gross tons. The production in 1879 was 3,070,875 net tons, or, 2,741,853 gross tons. The increase in 1880 over 1879 was, therefore, 1,224,539 net tons, or, 1,093,338 gross tons, or 40 per cent. The production of 1879 was larger than that of any preceding year, but the production of 1880 was not only 40 per cent. larger than that of 1879, but it was 50 per cent. larger than that of the two preceding most active years, 1872 and 1873, and it was *double* that of the Centennial year, 1876, when the production of pig iron during the panic years reached its lowest point. The following figures, in net tons, will make these extraordinary facts plain to the eye. Production:

1872	2,854,558
1873	2,868,278
1874	2,689,413
1875	2,266,581
1876	2,093,236
1877	2,314,585
1878	2,577,361
1879	3,070,875
1880	4,295,414

Twenty-three States made pig iron in 1880, one more than in 1879, Minnesota entering the list for the first time with her Duluth charcoal furnace—the pioneer, we have no doubt, of many other iron enterprises in her borders. North Carolina has not made any pig iron since 1877. Oregon, with her Oswego charcoal furnace, doubled in 1880 her production of 1879. Another State, Colorado, has its first furnace, at South Pueblo, ready to be put in blast. California and Washington Territory are getting ready to make pig iron, a furnace in each being well under way. Utah Territory has made no pig iron since 1876, but the largest and best of its two furnaces, the one at Ogden, is likely to be blown in this year.

What Color Is.

In a recent public lecture on "Color and its Cause," delivered in Poughkeepsie, N. Y., Prof. L. C. Cooley, of Vassar College, explained what color is, using the molecular theory of matter, and the wave theory of light. The lecture, which was illustrated by a number of beautiful experiments, closed as follows:

The question of color is one of great complexity, for it involves the profound problems of solar light composed of constituents, refrangible in different degrees, of atoms and molecules of bodies having the power of sifting solar light in various ways, and thus producing the colors observed in nature and art. And yet, strange as it may seem, color has no absolute material existence in nature outside of consciousness. It does not exist as an entity in the gorgeous hues of the rainbow, nor in the petals of the rose; these have molecular structures which reflect and refract the light back to the eye of the observer, an impression is produced on the retina of the eye and conducted thence to the sense centers of the brain where it is transformed into a conscious sensation of color, and we speak of it as a property of things in nature, though in reality it is energy transformed in the brain of organized life forms. Here the mystery is indeed profound, for it is correlated with life and defies analysis or interpretation.

Steam-Engine Tests.

By F. F. Hemenway.

Various circumstances have led me to inquire whether "Steam-Engine Tests," as usually carried on, are of much scientific or practical value. The writer has always been inclined to question their utility in settling the relative economy of different engines, and this feeling of distrust has been intensified in witnessing a series of tests of two large engines, presumably exact duplicates. In these tests the coal was selected, and the furnaces all charged by one man, and he an expert fireman: while the engines were under the charge of those perfectly familiar with every detail of their construction and management. The same boilers were used for all tests, and equal steam pressure and load maintained, and there were no atmospheric or other changes noted that would be liable to affect the results. Under these circumstances the results that did obtain possess some features of interest on the subject of steam-engine tests.

For instance, the mean of all tests from each engine showed a difference in economy, as between the two, of less than 1½ per cent.; but the difference between the best performance of one engine and the poorest performance of the other, for a single test, was 11½ per cent. Again, the least difference between two tests of the same engine was 5 per cent., and the greatest corresponding difference was more than 12 per cent. The mean difference of all tests from both engines was 5 per cent. An inference to be drawn from this is, that while the performance of these engines for considerable periods was practically identical, they could not be run for eight or ten hours at a less average variation than 5 per cent., or at a maximum variation of 12 per cent.; and that there could be no adequate reason assigned for this variation. Any single test of either engine might, for all observations to the contrary, have been taken as conclusive, in which event there would have been a probable variation of 5 per cent., or a possible variation of 11½ per cent. A variation of 5 per cent. would naturally lead to an examination for some defect; but a variation of 11½ per cent. would have been almost proof positive of something seriously wrong. Had these engines been operated at different steam pressures, or at different cut-offs, an easy solution would have been at hand, with an excellent showing for superheating, or a steam jacket. But had they been from different builders, or of different types, compound or simple, high speed or low speed, Mr. A. or Mr. B. would have gained notoriety cheaply and unjustly. It should be stated that these tests were not made by a novice, but by an engineer of extended practice in making such tests, assisted by four educated engineers, and that their system of observations was such as to present two complete logs, even to the minutest detail. What would have been the results with different experts, and different management of engine and boilers for each test, can only be conjectured.

Some years since, several tests of steam engines were made at the fair of the American Institute, and, in some instances, results obtained which the best engineers of to-day do not even try to equal, viz.: the accounting for 91 per cent. of feed water in dry steam at exhaust opening, in an unjacketed cylinder, at a cut-off at less than a quarter-stroke piston speed of 425 feet per minute, and steam noted as being "wet." Now, if this result cannot be reached in the best practice, such a test can hardly be considered of much scientific value, and it is quite as difficult to see in it any practical value. The prospective purchaser of a steam engine is not, usually, particularly interested in an experiment, the chief end of which is the determination of the relative efficiency of different bureaus of experts. He will hardly be willing to pay them $50 a day as practical engineers. Neither does he care much about the quantity of coal that would have been burned in a certain number of hours, *if* the boiler had evaporated — pounds of water with — pounds of coal, and *if* the water was correctly measured. What he wants to know is, how much his power will cost him, or, so far as coal is concerned, how much he will have to pay for per month or per year, with reasonably careful management; and this is what he don't find out in six or eight hours. The test of an engine, to be of much value, should be not less than one week in duration, and should be made under ordinary running conditions, and calculated from the coal burned. I am aware this is not orthodox—saddling the boiler performance to that of the engine, and *vice versa;* but I believe that in tests of two engines from the same boiler, the coal burned is a better standard by which to measure their relative economy than is the water supplied. In all boilers of ordinary construction a considerable per-cent. of the water supplied is entrained with the steam, and there has been no way devised, or at least none made public, to which one would be justified in pinning a great amount of faith, for determining the quality of steam as ordinarily drawn from a boiler.

The water thus entrained is a fluctuating quantity, varying with every change in the conditions under which the boiler is operated, and particularly with the manner in which the steam is taken from the boiler. Of two engines using steam from the same boiler and doing equal work, the one may take, along with an equal quantity of steam, twice as much water as the other. If we had means for determining accurately the quantity of water in, or with, the steam, we do not know with any certainty the effect of its presence on the economical performance of the engines. Some of the tests at the fair of the American Institute previously referred to, throw some light—or darkness—on the water test. For instance, of two engines of equal dimensions and operated at the same piston speed and with steam from the same boiler, the one with its cylinder steam jacketed accounted for but 79 per cent. of the feed water, while the one with an unjacketed cylinder accounted for 91 per cent., and the committee were of the opinion that this difference of 12 per cent. represented the difference in the amount of water entrained in the two instances. Had the results been reversed, is it not considerably more than probable that it would have been claimed as a triumph for the steam jacket? As the boiler used had a grate surface of 45 square feet, it does not seem probable that heavy firing had much to do with the result; nor is it easier to believe that the "manner of firing or opening the fire doors," was accountable for it. However this may be, the pertinent fact is that if 12 per cent. more of the feed water was carried off unevaporated in the one instance than in the other, the water test did not amount to much, and the coal *actually burned* would have been a better standard of comparison. If no more than 8 hours can be devoted to the test of a steam engine, more accurate knowledge can be gained by supplementing the indicator diagrams with a careful examination of the parts of the engine as a machine, and particularly the valves and piston under steam at every position in the stroke. While I am not rash enough to claim infallibility for the indicator, or that it can properly supersede extended tests, I do believe that a perfect instrument (and some brains) can determine the cylinder efficiency of a steam engine so closely, as to leave little for improvement, and that calculations based on its indications and a careful examination are by far more reliable than any other test of six or eight hours duration.

Rolling Mill Engine.

Rolling Mill Engine of the New Jersey Steel and Iron Company.

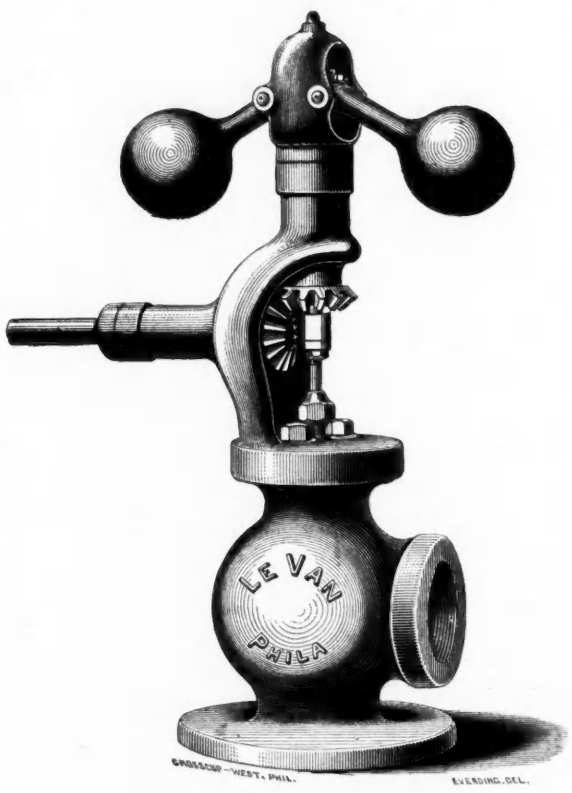
This engine, shown in the accompanying illustration, was built by Robt. Wetherill & Co., Chester, Pa. It represents a modified form of the Corliss engine, and was designed especially for this work, all the moving parts and wearing surfaces having been made as large as possible to make them durable. The size of the engine is 36 inches diameter cylinder by 42 inches stroke; the housing, which is of the bell type, is so arranged as to give free access to the machinery.

The two platforms are so disposed in housing as to make all the valve gear accessible from them, the engine being worked from the second platform.

The controlling power of the governor is

transmitted through a vertical shaft, which passes through the first and second platforms to toothed gears attached to main foot under housing, the rotation of the latter being accomplished by belt from main shaft of engine.

A noticeable feature is the improved arrangement of governor which does away with the oil pot, and requires less attention, and gives a more regular speed to engine by regulating properly the point at which the cut-off should take place. The piston, which is Wetherill's patent, is self packing, the rings being set out with German silver elliptic springs, making what is claimed to be a perfectly steam-tight piston with but a very small amount of friction. The followers being cast with piston head complete leave



LE VAN'S STEAM-ENGINE GOVERNOR.

no nuts or any loose parts liable to work out and get in cylinder.

The piston has been applied satisfactorily and economically by Wetherill & Co. for the last eight years.

The dimensions of some of the main parts of this engine are as follows: Shaft in main bearing, 15″ diameter; length of main bearing, 30″; crank pin of steel, 9″ diameter by 11″ long; cross-head pin, 7″ diameter by 7¾″ long; piston rod (hammered iron) 5″ diameter; main base plate has been made very large and heavy to insure a perfectly rigid base for engine, being 8 feet wide and 14 feet long, cast in two pieces—faces planed and bolted together with bolts fitted to reamed holes.

LeVan's Steam-Engine Governor.

The governor shown here with, was originated by the well-known engineer, W. Barnet LeVan, 3607 Baring street, Philadelphia, some years ago, but owing to the demands of other business upon the designer's attention, it has never been placed generally upon the market. In construction this governor is simple and compact; is driven at a high speed, and is therefore very sensitive, so that the working of the engine is rendered uniform under varying pressures of steam or sudden changes of load. The valve is nearly steam balanced, having an excess area at the bottom equal only to the small rod of the valve. This excess area is sufficient for the pressure of steam to carry the weight of the valve, and thus prevent wear in the coupling. When the balls are at rest the valve is fully open; as soon as they begin to rise the valve is depressed, closing the opening. The engine is thus controlled by the oscillation of the valve shutting off and admitting steam, so as to maintain a uniform speed of the engine under every variation of load.

The form of the governor, as above illustrated will at once convey the fact to a practical mind that complicated and expensive details are avoided, while the working parts are reliable and easy of access. To insure perfect regulation of speed under all circumstances, there must be no slipping of the belt. A flat belt should be used, and as wide as possible consistent with size of governor. In no case should the pulley be less than 4 inches in diameter, and the belt 1½ inches wide. When very short or vertical belts must be used—the pulleys should be leather covered, to prevent slipping. The governor should not be driven by round belts or cords.

The simplicity of design, facility of construction, and small amount of material employed, enable this governor to be offered at a very low price, and it is to be hoped that suitable arrangements will be made to bring it into extended use.

Spontaneous Ignition.

Attention has recently been called to some peculiar cases of spontaneous ignition of hydrogen in air, the phenomenon having been noticed, it seems, in factories where quantities of zinc were being dissolved in hydrochloric acid for the preparation of zinc chloride. Violent explosions took place when no flame was near, and it was eventually ascertained that the gas took fire spontaneously. It is thought to be caused by fragments of very porous zinc, which, when lifted above the surface of the liquid, during the violent evolution of the gas, and so brought into contact with hydrogen and air, act just as spongy platinum would do under the circumstances. The performance of such operations in the open air is recommended. The ignition can be shown, according to M. Hoffman, by treating a few kilogrammes of finely divided zinc with acid; the zinc dust, he says, may even ignite with water.—*Universal Engineer.*

LETTERS FROM PRACTICAL MEN.

New Surface Gauge.

Editor American Machinist:

I forward to you, with a short description, a plan of a surface gauge, which I believe to be new in the application of the screw and sliding sleeve. For convenient and positive adjustment, it certainly excels the form long in use. The indicator point of the old gauge can be placed only approximately in the position desired, and then screwed fast, after which we must move it up or down, as the case requires, with the nearest hammer, wrench, or block in reach, and usually wish we had three hands before the operation is completed.

In the sketch we have a section through the length of the device.

The base *A* and standard *B* are the same as in the common gauge, save the addition of the counter bore, which receives the lower end of the sleeve.

The upper end of sleeve is closed, excepting the hole for the screw *S*, which passes into the standard. A stiff spiral spring is placed on top of the standard, which causes the sleeve to press against the screw head, and follow its motion up and down.

A slot is cut through the sleeve at *D* to accommodate a stud, thereby preventing the sleeve from turning with the screw.

The plan of the indicator holder is shown at *H*, where it will be observed that the pointer and clamp are both fastened with one screw.

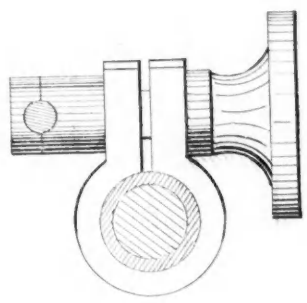
The design is by Mr. Walter B. Pearson, one of the students in our mechanical engineering department.

CHARLES L. KING,
Supt. Machine Shops,
University of Wisconsin.
Madison, Wis.

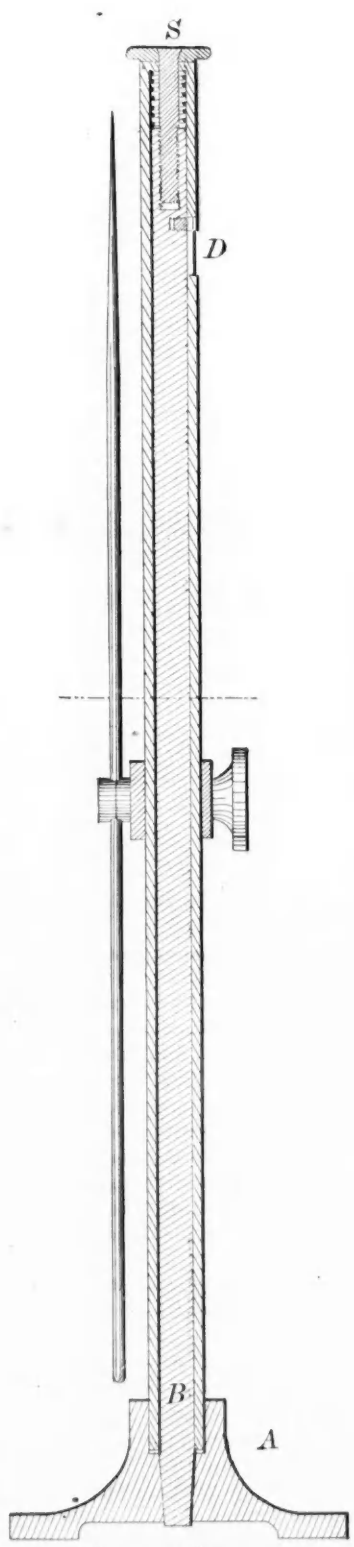
Shading Drawings.

Editor American Machinist:

I have run across an idea which is so valuable to draughtsmen, that I think it worth



H
SLEEVE.



SURFACE GAUGE.

passing around. In ordinary drawings for shop use draughtsmen do not like to shade round bodies by lines in india ink, as their lines resemble outlines, etc., so much as to cause trouble. Shading with brush and India ink is too big a job, and with the ordinary black lead pencil, the effect is "flat," and the pencil mark rubs off. My friend, W. H. Thompson (of the Cuyahoga Works, Cleveland), uses an ordinary *blue* lead pencil, for this purpose. The effect is just what is wanted for such work; it does not rub off, is very quickly done, and it gives the drawing a fresh and picturesque appearance which is very pleasing. The blue lines never can be mistaken for blue ink distance lines, as they are much wider. A great deal of free-hand shading can also be done with it. The item of time alone recommends it, as a drawing can be shaded in one half the time with a blue pencil that india ink lines would require. I have in my own work substituted one of the ordinary aniline indelible pencils, which I prefer to the ordinary blue lead pencils as the marks are much more indelible.

FRANK C. SMITH.
Delaware, Ohio, Feb. 24, 1881.

How, and How Not, to Measure.

Editor American Machinist:

In answer to the query of *O. S.* permit me to say, that the differences in measurement, of which he complains, probably arise from the fact that different men do not use the same instrument with which to mark off the foot divisions in the ten foot pole. Jack-knives, cut nails, thumb-nails, pieces of chalk, all are liable to vary from each other in size and thickness, while the division lines must have some breadth, even when the finest. How long is a ten-foot pole? Ten times the length of a standard twelve inch rule, $120'' = \frac{120000}{1000}''$, "standard size," measured in an intelligent manner, involving no skill, simply a willingness to adopt and use in a common-sense way the means which skill has produced in the way of standard rules and measuring machines. If a ten-foot pole be marked off by placing a twelve-inch steel rule even with one end, and making a mark at the front end, then advancing the rule, and repeating the operation until nine marks have been made, and the last end of the pole has been cut exactly where the tenth mark would be, it is not probable that it will be correct, either in extreme length, or divisions. Why? Because in making the marks in front of the rule, the entire mark, no matter how broad, is outside of the end of the rule, when to be correct the exact center of the mark should agree with the end of the rule, and further, because in advancing the rule for the successive marks, it is impossible to determine when its back end exactly matches the mark. So much for *how not.*

How? If you have two standard twelve-inch rules and a couple of clamps you are fully equipped; if you have but one rule, carefully cut to precisely the same length a piece of sheet steel, or iron, squaring the ends up perfectly. Now with the prospective ten-foot pole having one end squared up perfectly, deal thus: Place one of the rules with an end exactly even with the end of the pole, clamp it firmly in that position, make the first mark at the front end of the rule; then, before taking off the clamp which holds the first rule, clamp on the second rule with its back end resting firmly against the front end of the first one. Now remove the first rule, and not only make the mark at the front end of the second rule, but correct the one made before, by marking it over. In this way the center of the mark should be in the exact spot where the ends of the two rules meet; continue this way to the end, and not only two poles may be made alike, but two thousand, if wanted.

S. W. GOODYEAR.
Pittsburgh, Feb. 23, 1881.

Dog in the Manger Patents.

Editor American Machinist:

In your issue of Feb. 19, I note an article on "A Dog in the Manger." The remedy suggested to my mind would be, to require by law all patented articles to be manufactured and offered for sale within a reasonable time under penalty of forfeiture. Could not such a law be passed?

ARTHUR CONE.
St. Louis, Mo., Feb. 19, 1881.

Mechanical Mistakes.

Editor American Machinist:

It is always easier to find faults than to correct them; and while the mistakes of past ages are being so generally sought after, it may be of interest to notice some of the mistakes of the present time in the mechanical world.

In doing this, I do not propose to furnish a panacea for the evils referred to, but leave the remedy and application with those interested in a cure.

There will be, doubtless, some readers of the American Machinist who will differ with me and say, "Physician, heal thyself."

Manufacturers generally look upon their own products as very free from faults, and often chuckle over the apparent mistakes of competitors.

I know this from experience, and have at such times felt that to point out what I deemed mistakes of others, in a public way, would be very prejudicial to my own business. This may seem selfish, but it is human nature nevertheless.

About thirty-two years ago I commenced to build a small steam engine, and finished it two years afterwards, doing the work mostly after working hours. This engine was well under way before I knew how the steam was to get away from the cylinder, the other functions of the valve being but partially understood.

From that time to this I have been looking out for mistakes, and have often found them of my own making.

Not long since, an engine cylinder, of about fifty-horse power, came into my hands for repairs, and on examining the slide valve, which was of the usual D form, I found it required to have five-eighths of an inch cut out of the exhaust opening. The effect of such an error in construction will readily be seen by those familiar with such things; and it is to be presumed there are hundreds like it. It reminded me of my early experience with slide valves.

Closely allied to freeing the cylinder of spent steam is that of liberating the condensed steam, and, perhaps, primage from the boiler.

A common error is to connect two pipes, one from each end of the cylinder, to a T, and then carry off the water through one pipe.

This was another of my early mistakes; the effect being that much of the water was forced from the steam end into the exhaust end of cylinder alternately. Especially will this be so if the back pressure is brought low, as should always be done.

Excessive back pressure is evidence of another mistake in construction, especially in portable engines, and where exhaust steam is used for heating purposes.

The extent of this error is seldom known, as it can only be accurately determined by the use of a steam-engine indicator—an instrument that many engine builders know but little of, and never use, which is another serious mistake. Quirk.

Chattanooga, Tenn.

Testing Bleached Shellac.

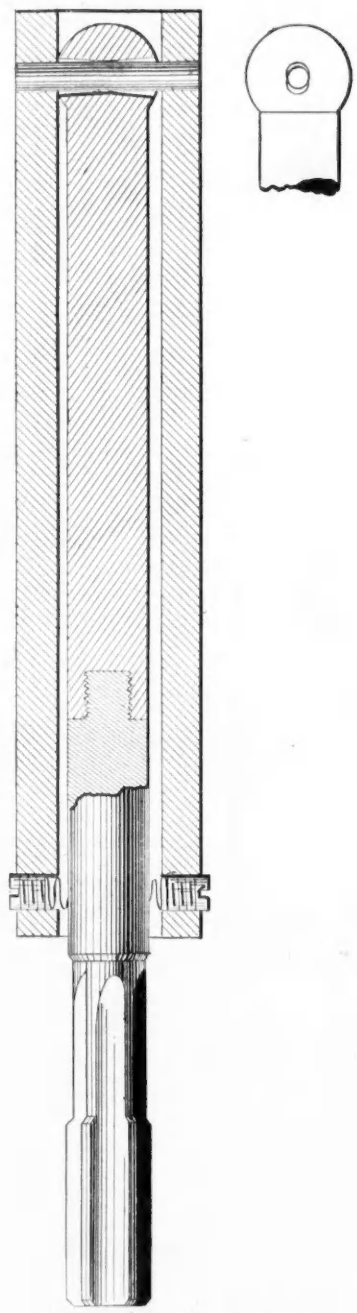
Editor American Machinist:

Several years ago I received a quantity of exceptionally good bleached shellac. A portion was dissolved, and the rest lay for a year or more in a close drawer in a warm room. When the latter was required for use, it was found that it would not dissolve in the alcohol, but would only swell up and soften into a jelly, like glue soaked in cold water. When the alcohol was pressed out between the fingers, the shellac remained of a dryish earth-like consistency, without any adhesive properties whatever. At first it was supposed to be the fault of the alcohol, but after that had been tested and found good, I concluded that the shellac had oxidized, or in some other manner deteriorated by age.

When bleached shellac is new, it is very solid and breaks with a clear fracture, but as it grows older, it becomes friable, often so much so as to be easily crushed in the hand. At this stage it is usually impossible to dissolve it in cold or slightly warmed alcohol, the only method that I have tried. When the shellac does not look well, I test it by placing a small piece in a glass and covering it with alcohol. If it is good enough, it will dissolve in five or ten minutes, covering the bottom of the glass an eighth of an inch deep. If it is not good, it will only swell up, not coloring the alcohol at all.

Ray.

Springfield, Mass.



Reamer or Boring Tool.

New Reamer or Boring Tool.

Editor American Machinist:

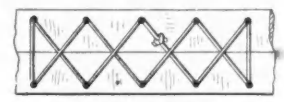
Probably some of your readers are using screw machines to bore and turn small gears, wheels, etc., and no doubt have had difficulty in keeping the holes reamed straight and of uniform size, in consequence of the machine getting out of line. The method of holding the reamer, shown in the accompanying drawing, has overcome all my trouble in this direction, and perhaps may be acceptable to some one who has not yet found a remedy. The ball-shaped end filling the hole in the socket (which is put back as far as possible in the hole in turret), and held as shown, allows the same freedom of movement as in the ordinary operation of chucking in a lathe. Three or four springs at the front serve to keep the reamer in position to enter. This tool (which is not patented) is the "joint invention" of a "rising young artist" from Hartford, known as "Joe" Bowers, and yours truly, Walter L. Cheney.

Orange, Mass., Feb. 24, 1881.

A Belt Joint.

Editor American Machinist:

Enclosed I send you a joint cut out of a narrow belt, which is represented by the annexed cut, showing my method of lacing light belts with wire, and it makes the best joint I ever saw. Have used it about four years, and like it better and better. The



A Belt Joint.

best wire for the purpose is No. 22 annealed brass. Have tried No. 23 copper wire, but it breaks too easy. Albert Baker.

Westfield, Pa.

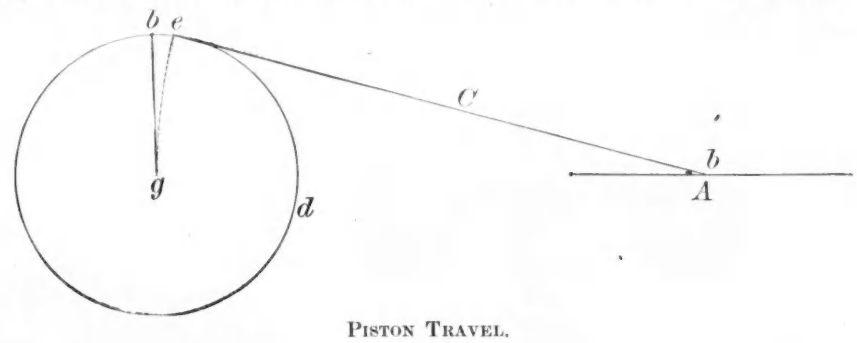
Illustration of Piston Travel.

Editor American Machinist:

One of your inquirers asks why the piston of an engine runs faster one half of the stroke than the other. This question puzzles a great many, and an ordinary answer does not always make it plain. I find the accompanying diagram the simplest and clearest way of illustration, but have never seen it published. The guides are represented by *A*, the center of cross head by *b*, the connecting rod by *c*, the circle described by crank pin by *d*, the end of rod by *e*, and *f* showing the pin at half stroke. Now the rod *c*, from *e* to *b*, is the same length as from *b* to center of shaft *g*. But when the rod is brought up to the pin *f*, the piston has to be brought forward, therefore the piston will travel fastest at the back end of the cylinder, as it has farther to go in the same length of time.

W. E. Crane,

Waterbury, Conn., Feb. 25, 1881.



Piston Travel.

Lack of Independent Thought in the Shop.

Editor American Machinist:

Why are there so few really good mechanics?

Is it not surprising that so small a percentage of men who boast of having "learned a trade" are really so deficient? Men who have naturally an accurate eye can plane up a piece of work "true," and to the required measurement, and turn it over to the foreman a very creditable "job;" and there are many of them. But when these same men are entrusted with the repairs of machinery, especially if at all intricate in its arrangement, few use the proper judgment and thought that it is fair to suppose a man boasting himself a "mechanic" should.

It is a very common thing to hear men say, "I have taken the thing all apart, and can't see anything wrong with it." They cannot tell how nor where to look for the defect, and instead of attempting to find just where the difficulty lies, *with a cause for it*, they fly around and "take the thing to pieces," hoping to find the trouble lurking about somewhere inside, and not finding it, "put the thing together again." Perhaps it goes off all right if the fault is not due to undue wear or breakage, in which case the man reports to the foreman, "the job is all right"—"works better than it has for a long time"—while he is totally ignorant of the cause of the trouble or the cause for its starting off all right, and thinks no more about it.

If it had not gone as it should, very probably he would have spent hours, when minutes, with a little intelligent thought on the subject, would have sufficed.

I once asked the question of a large manufacturer of steam pumps, having occasion to complain of the unsatisfactory work of one of his men: "Why is it that men do not think for themselves? If there is anything wrong with a steam valve, for instance, out of the ordinary course, either you or your superintendent have to look into the matter and give directions for remedying the difficulty. Your workman looks into the chest in blank bewilderment, and, when shown the cause for the trouble, says, 'Why, I didn't think of that,' or to that effect." The reply I received was, "If all mechanics were as you would have them, there would be no room for you and me."

It may be so; but it seems to me that a man's natural ambition should impel him to think for himself. There is room for a number of that class of mechanics.

The lack of thought in men may not be seen so plainly in a shop at work on specialties, where the workmen are continually under the eye of a competent foreman, who does the thinking for them. But in large factories, where repair work is done in a shop on the premises, or where men are to be sent into different departments to effect repairs, and the eye of the foreman can't follow them, the work is left to their own judgment, faults of this kind are seen to an extent that would be thought impossible among intelligent men.

Why is it so? Is it not because these men have never learned to think for themselves?

One would suppose that experience would teach this lesson. It seems as if the faculty of thinking passes away with their apprenticeship. It is to be hoped that the apprentices of to-day will not let this faculty lie dormant. Thought.

Brooklyn, N. Y., Feb. 28, 1881.

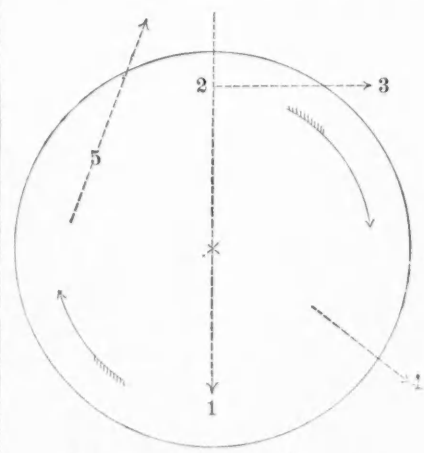
Counterbalancing Engines.

Editor American Machinist:

The inquiry of J. H. Killey is one which may very properly give rise to considerable discussion. Without attempting mathematical analysis, I would say that—finding in general practice better results given by no counterbalance than by too heavy ones, and thinking some better way might exist than either, I attempted, and was apparently successful with the accompanying diagram.

The shock of arrested motion is represented by 1. The usual counterbalance being at 2; its inertia tends towards 3, the resultant being a shock in the direction of 4. By placing the counterbalance at 5, the tendency of its arrested motion, to a greater or less extent, counteracts the shock 1. I have run an English gate—heavy—at 200 revolutions per minute, by this means, with so little jar as to be able to write on my knee while sitting on the carriage close to the saw.

The shock 1 is evidently the resultant, not only of the weight of the connecting rod, but of all other parts moving with it, and for a full solution of the position 5 all



Counterbalancing Engines.

these data must be weighed. The pin being attached to the wheel (or crank) can evidently be balanced at 2, with so much of the connecting rod as has its center of gravity coincident with the pin. The rest of the reciprocating parts will be found better balanced nearer 5, and it appears to me that some person competent to the task, and having leisure therefor, might give useful information, perhaps even rules, towards finding its place and weight. This will, of course, apply only to engines moving in a single direction. G. W. Pearsons.

Kansas City, Mo.

Cutting Tools.—A Well-tried Shaft Coupling.

Editor American Machinist:

I notice in your issue of February 26th, a device for an iron planer to hold the cutting

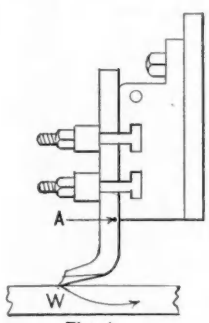


Fig. 1

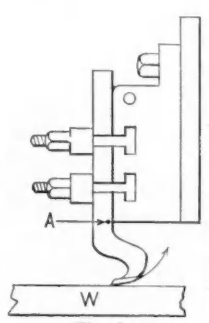


Fig. 2

tools, and also a letter from C. C. Hill on finishing cylindrical work, and two letters on shaft couplings. The planer device is a good thing in its way, but there is an easier way of accomplishing the same object, this way being to shape tools according to the Whitworth system, which is shown in Fig. 1. The whole idea is to place the cutting edge of the tool in such a position with relation to its body, that the spring of the tool shall be in a direction to have the least possible effect in affecting the depth of the cut. Thus the spring will have, as its center of motion, the dot at A, and the cutting edge being at the shortest radius or distance from A, the motion is the least possible, while it is so placed that its line of spring, as denoted by the curved arrow, is the nearest possible, as to coincidence, with the work surface.

Now examine the tool in Fig. 2, and you will observe that to whatever extent it springs, it dips into the work, while the radius from the center of motion of the spring is greater than in Fig. 1, and, therefore, its effect upon the work under a given amount of spring. If any practical mechanic wants to become convinced on this point, let him place a tool with its cutting edge 10 inches out from the tool post, and he will find that shown in Fig. 1 will work easily enough, to take a good cut with, while that in Fig. 2 will cause great difficulty.

It is just the same in lathe work. The tool for really true work should be on the Whitworth plan, as in Fig. 3, and not the abortion shown in Fig. 4. I never found any difficulty in turning cylindrically true work; and by cylindrically true work, I mean *true*, not to $\frac{1}{1000}$, but so true that callipers adjusted with the most delicate adjustment, failed to show any error whatever in short work. This requires no trouble at all, but in long slender work it requires considerable care. While on this subject of lathe work, let me ask your readers to state in your columns how they would chuck the piece of work shown in Fig. 5, it having a cone at A, and a left-hand thread of, say, 4 pitch at B, to be made dead true with the axial line of the shaft?

On the coupling question, let me say that I know of a line of shafting about 100 feet long and three inches diameter, driving at its extreme end very heavy machinery, as a steel tyre stretching machine, a blower for a blacksmith shop having 25 fires (the farthest being 200 feet from the blowers), an hydraulic press, two heavy plate shears and punching presses for boiler making, a set of rolls, a bolt-forging machine, and several other machines. The couplings were put on in 1847. I left them running in 1867, and not one had ever given the least trouble whatever, or been touched, except that in 1867 I put on a new one to extend the shaft line, to drive an axle-turning lathe for steel crank handles, the lathe having six slide rests. I chipped and filed the shafts, chipped keyways and fitted the coupling in two days' work. Two years ago I made an enquiry if these coupings had ever given out, and was informed they never had, and that the engine had not stopped one moment on their account since 1847. I may add that one length of shaft in that shop had a length of over 30 feet of 3″ shaft; thus coupled and *without any bearing* to support it, and drove a pair of *heavy* bevel wheels that broke about every four years from the strain. They had about a 6″ face, were 26″ diameter, and had eight heavy arms. The form of this coupling is such as in Fig. 5, being an improvement on a somewhat similar form already illustrated in your columns. The joint, however, is not parallel to the shaft axis, but at an angle to the shaft axis, as denoted by the dotted line.

This prevents the joint from separating endways, while the coupling and key cause the end faces at A B to be forced together, and this very pressure, on account of the dovetail feature of those surfaces, forces the longitudinal joint faces together, the ends of the shaft acting as drivers. Also because of this dovetail feature, the key is almost superfluous, as a simple set screw would be ample, because there is no strain

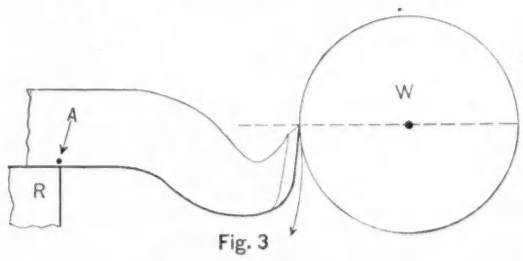
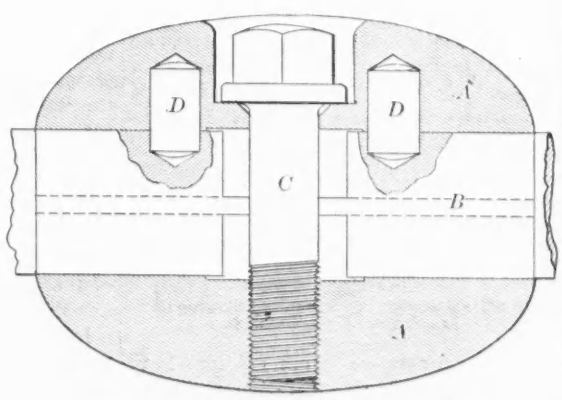


Fig. 3

tending to move the shafts endwise. This may not be a *cheap* coupling, but it is, beyond question, a superior one, and, in my opinion, the best of any yet devised. Of course I am assuming that the shafts are turned to equal diameters and to fit the sleeve, which I do, because I never found any trouble in that respect.

Joshua Rose, M. E.

New York, March, 1881.



Coupling for Light Shafting.

Coupling for Light Shafting.

Editor American Machinist:

The accompanying sketch will convey to your mind a fair idea of a simple and efficient shaft coupling which we are using in our establishment to connect the sections of a line of 1¾″ shafting.

This coupling is extremely simple, as will be seen by the engraving, and consists of two halves *a a*, of cast iron which are drawn together by the bolt *c*; the centre of the coupling is recessed to enable the coupling to take a better hold on the shaft which is prevented from turning by the pins *d d*. This coupling offers no projections to catch the clothes or belts; is quickly applied or removed. One line shaft upon which these couplings are used transmits power to drive the following machines, viz.: 6 engine lathes-4 speed lathes, 1¼″ shafts, 12 small bench lathes; while another drives 1 Brown and Sharpe milling machine, 1 cutting off lathe, 13 engine lathes, 1 upright drill, 4 band, speed lathes, 16 small bench lathes, 1 grinding machine, 1 shaper, 9 special grinding

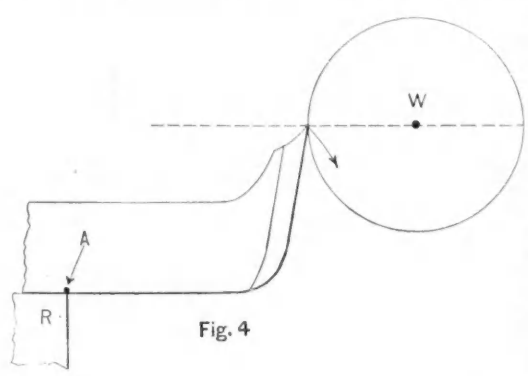


Fig. 4

machines, and all running at a high rate of speed. The American Watch Company use this style of coupling for all of their line shafting. Ambrose Webster.

Waltham, Mass.

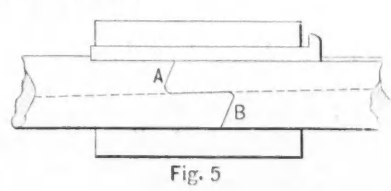


Fig. 5

Newly Incorporated Companies.

NEW YORK.

New York Steam Forge Company, New York; Thomas I. Suzade, John S. Newbury and others incorporators; Capital $25,000, in shares of $50 each. For the manufacture of and dealing in railroad car axles and other iron work. Feb. 28.

United States Artificial Stone and Marble Company, New York; Henry D. Wallen, Wm. T. Crim and others incorporators; Capital $150,000, in shares of $10 each. To manufacture stone and marble under patents granted to Wm. H. Young. Feb. 28.

Siemens Anderson Steel Company, New York; Robt. J. Anderson, L. M. Lawson and others incorporators; Capital $1,500,000, in shares of $100 each. For the manufacture of steel and iron under the Siemens patent process. Feb. 28.

The Double Weaving and Cutting Company, New York; Herman Kobbe, Walter Kobbe and others incorporators; Capital $300,000, in shares of $100 each. For the manufacture of machinery (under patents granted to Reuben H. Plass) for the splitting or cutting of pile fabrics, and for the manufacture and sale of pile fabrics. Feb. 28.

The Cowman Manufacturing Company, New York; Capital, $500,000, in shares of $100 each; John Cowman, Geo. Henry Frost and others, incorporators. For the manufacture, use and sale of cigarette machines, and the transaction of business connected therewith.

The Chronometer Stamp Company, New York; Frank B. Wood, Henry J. Brown and others, incorporators; Capital, $50,000 in shares of $25 each. For the manufacture and sale of chronometer stamps, and other business connected therewith. March 1st.

The Paul Security Box Company, New York; George D. Paul, Wm. Lisle, Jr., and others, incorporators; Capital, $100,000, in shares of $20 each. To manufacture and sell letter boxes and boxes for collecting fares, and to have such boxes upon a royalty. March 2.

The Bradford Pen Manufacturing Company (limited), Mount Vernon, Westchester County; George Bradford, John H. Bennet and others, incorporators; Capital $20,000, in shares of $100 each. For the manufacture and sale of steel and metallic pens, pen-holders, tips, fountains, and other articles used in and belonging to the pen trade. March 2.

CONNECTICUT.

The Crosby Manufacturing Company, Glastonbury. Edwin Crosby, Lincoln E. Crosby, *et al.* incorporators. Capital, $20,000. Shares, $100. Purposes the manufacture of woolen cloths and yarns.

Certificate filed March 2, 1881.

MASSACHUSETTS.

The W. G. Medlicott Co., Springfield; Wm. G. Medlicott, Prest., James Kirkham, Treas.; Capital, $100,000, in shares of $100 each. For the manufacture and sale of knit goods and kindred articles. Feb. 28.

Boston Steamboat and Pier Company, Boston. J. W. Norcross, President; Arthur D. McClellan, Treasurer. Capital, $100,000, in shares of $100 each. For the carrying on of the business of a common carrier by water, of persons and property to and from Boston, Point Shirley, Broad Sound Pier, Nahant, Lynn, and other cities along the coast of Massachusetts, and the building and maintaining of an ocean pier, cafe, and other buildings and structures at Broad Sound Point, in the town of Revere. Feb. 25.

Sinaloa and Durango Railway Co., Limited; Edward L. Davis, Chas. W. Pierce, S. W. Richardson, J. H. Brooks, Wm. H. Hill, Jr., R. R. Symon, Thos. N. Hart, W. S. Blanchard, J. S. Cumston, Directors; Capital, $100,000, in shares of $100 each. To construct and maintain a railroad and telegraph from the city and port of Altata, in the State of Sinaloa, United States of Mexico, thence northeast to and through the city of Culican, thence southeast to and through the city of Durango, in the State of Durango, and to any part of the State of Durango, and such other main line and branches as said corporation may be authorized to construct by the grant or grants of the Government of said United States of Mexico. March 1.

PENNSYLVANIA.

Girard Point Storage Company, Philadelphia; Joseph D. Potts, George B. Roberts and others, incorporators; Capital, $2,000,000, in shares of $100 each. For doing a general storage business, transferring merchandise from vessels to cars and cars to vessels, constructing elevators, wharves, warehouses, docks, lighters, tugs, and other appliances necessary for the transaction of the business of the company. Feb. 21.

North Side Passenger Railway Company, Pittsburgh; Wm. B. Rodgers, Wilson McCandless and others, incorporators; Capital, $100,000, in shares of $50 each. For the construction of a street railway in the cities of Pittsburgh and Allegheny. Feb. 25.

Park Passenger Railway Company, Pittsburgh; Wm. B. Rodgers, Joshua Rhodes and others, incorporators; Capital, $200,000, in shares of $50 each. For the construction of a street railway in the cities of Pittsburgh and Allegheny. Feb. 25.

Penn Incline Company, Pittsburgh; Wm. H. Latshaw, Jno. J. O'Reilly and others, incorporators; Capital, $50,000, in shares of $50 each. For the construction, maintenance and operation of one or more inclined-plane railways in the city of Pittsburgh. Feb. 26.

Finances of an Exhibition Society.

At the meeting of the Executive Committee of the New England Manufacturers' and Mechanics' Institute, held in Boston, March 2d, the treasurer's statement up to March 1, 1881, disclosed the following as the financial condition of the organization:

Original capital was $100,000; Jan. 6, '81, increased $100,000; Total, $200,000; all of which has been subscribed for except $15,000, which is about the amount required by law to be sold at public auction. Expended for incidental expenses for organization, printing, advertising, etc., $4,375.15; real estate and building account, $10,844.11; Total, $15,219.26; Balance, $184,780.74. Remarks were made by President James L. Little; Hon. E. R. Mudge of Boston; Hamilton A. Hill, Boston; Theodore C. Bates, of Worcester; Edward Kendall, of Cambridgeport.

The following officers were unanimously elected. Executive Committee for the year 1881-2: James M. Little, E. R. Mudge, William B. Merrill, John F. Wood, Royal C. Graves, Edward Kendall, R. M. Pulsifer, James H. Work, Henry Mason, George L. Damon, Frederick W. Griffin, A. L. Coolidge, Solomon A. Woods, Aretas Blood, W. C. Lovering, Frederick Grinnell, A. D. Lockwood, Fred Ames, George Crompton, George H. Corliss, Charles H. Hersey, James H. McMullan, Horace Fairbanks, William E. Barrows, Joseph R. Hawley. Treasurer, John F. Wood; Secretary, Frederick W. Griffin.

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NEW YORK, MARCH 19, 1881.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

How Can Monopolies be Restricted?

The popular movement against corporate monopolies, which a few months ago was started, with a view of securing legislation to restrict telegraph and transportation companies, has been exaggerated upon one hand, and ridiculed upon the other. As to the means and instruments by which the leaders of that movement expect to obtain the active co-operation of legislative bodies, we shall not inquire. The kind of influence brought to bear upon the members of these bodies, by wealthy corporations enjoying exclusive privileges granted by the State, is well known. It is pertinent to inquire what are to be considered as monopolies dangerous to the public welfare, and whether the general government and State governments are warranted in interfering with their schemes, so as to prevent wrong being done to the mass of citizens affected by such monopolies.

The word monopoly is thus defined by Webster: "The sole power of dealing in any species of goods or of dealing with a country or market obtained either by engrossing the articles in market by purchase or by a license from government; sole permission and power to deal; exclusive command or possession."

It is clear enough from this definition that monopolies are of two distinctive classes, one supported wholly by private resources and the other by government license or privilege. Both may be built up under the protection of unjust laws, but the right and duty of direct government interference would seem very plainly to adhere to cases in which the evil, for which a remedy is needed, exists by virtue of a special government license. This principle is not changed by the absence in any case of a charter of incorporation. Manufacturing establishments may be incorporated, but the act confers no greater privilege upon them than that of dividing their pecuniary interests into shares, represented by negotiable stock certificates. It gives them no favors in the way of conducting business.

Railroads may be owned by an individual or a firm, but special prerogatives are granted to them by the State the same as if they were incorporated. If a merchant or a manufacturer is able to control the market for some article of extended use by purchase, or if a combination of merchants or manufacturers are able to do so, it is difficult to see how the government can rightfully take such cognizance of the fact as to put a stop to their operations by special enactments, unless it had previously conferred particular powers upon them, the abuse of which constituted the monopoly.

There are those who have a chronic dislike of any government control of railroad or telegraph companies, but, according to our observation, these individuals seldom show any dislike of the granting of exclusive powers to the same companies by the government. A monopoly ought never to exist under special protection of the State. If it is a bad public policy for the government in cases of emergency to place increased restrictions upon transportation companies, it must be conceded that no proper authority exists to redress public grievances growing out of abuses of a government license. It is evident that any assumption leading to such a conclusion is a fallacy. Just how far the control of the State should be exercised is difficult to decide. It ought, however, to extend far enough to accomplish the desired object of protecting all classes of citizens from the oppression of licensed monopolies, *but no farther.* No good excuse can be offered for excessive and burdensome legal restrictions upon such companies, any more than one can be offered for the unjust use of the powers delegated to the companies themselves.

While on a short trip through Ohio, last week, we noticed an activity in machinery establishments which perhaps can best be expressed by the word "unparalleled." Some establishments, making heavy machinery and employing hundreds of workmen, are running twenty-four hours a day, using the electric light for night work. Nowhere could we hear any complaint for lack of orders, but everywhere there seems to be a scarcity of first-class machinists and draughtsmen. The call is for a kind of workmen that do not require a foreman to watch them on every job. Draughtsmen are needed who have a practical knowledge of the functions and operations of machinery, who not only can lay out a machine upon paper, but can tell how it will work when built after the plans furnished.

Iron Foundry Matters.

Considerable interest has lately been stirred up among our practical correspondents about iron foundry matters. The production of good castings is by some considered a matter largely governed by chance; while by others, of equally long experience, it is considered a direct result of skill, combined with good material and apparatus. Unless these latter elements are present in the machine shop, the boiler shop, the forging shop, and the pattern shop, results will necessarily be uncertain to a greater or less degree. Proper mixtures in the cupola and the shrinkage of iron in cooling must be well understood by the skillful foundryman. In some localities it is very hard to get good clean, smooth, iron castings. The reason, however, can be discovered in lack of skill rather than lack of facilities. In one foundry case lately coming to our attention, the castings were all very rough, and the superintendent argued that they could not be made to come out smooth. One day a customer, after berating the concern for furnishing such rough work, threw an armful of oyster shells into the cupola when it was charged, the result being to cause smooth and regular castings at the next moulding. The observance of such little details about a foundry often makes a surprising difference in the quality of work produced. In shrinking, the smallest parts of a casting cool, and often become hard while the thicker and heavier parts are still in a molten state. This is likely to cause a distortion of the parts.

By some methods the heavier parts are cooled artificially, so as to prevent springing and cracking. The most uniform castings, however, are made by keeping the thin and light parts in a molten state, until the whole solidifies together. This prevents twisting and distortion, also makes the castings uniformly solid. Castings are regularly made in this city, proportioned like a wheel (in one piece), with spokes as thin as a ¼ inch gas pipe, and a rim as large as a man's leg, without any more distortion of parts than if moulded of wax from the same pattern. Such jobs are not exceptional in the foundry referred to, but are common and are not considered wonderful. The small parts are jacketed, so to speak, with melted iron, at the same time the mould is filled, so that the whole cools gradually and uniformly.

Foundrymen should study into cause and effect as much as machinists or any other mechanics. The improvements in iron foundries within a few years have been numerous and important, and there is still room for more progress. Many manufacturers are now adding small foundries to their other plant, and there is need of a more widespread knowledge of iron casting.

Learning Two Trades.

Recent discussions in our columns have well emphasized the fact that there are many ambitious mechanics who would find it to their advantage to learn two trades, namely, those of the pattern maker and moulder, the old saw, "Jack of all trades, master of none," to the contrary notwithstanding. These two trades so interchange and run together (where they do not hinder each other, owing to the want of a common bond of knowledge), that every establishment in which a variety of mechanical work is carried on, is a standing proof of the wisdom of this conclusion. The pattern maker who goes on making new patterns that cannot be reasonably cast, in serene unconsciousness of the trouble thus inflicted upon the hapless moulder, is not a profitable feature of any establishment. The moulder, who is also an expert pattern-maker, need not necessarily be any the worse moulder, while in many shops, the ability to turn his hand readily from the one branch to the other, should circumstances require, is one which is not likely to lack either profit or appreciation.

Opportunities in the Northwest.

We recently received a letter from a resident of Minnesota, asking if we could put him in communication with an engineer who has a thorough knowledge of the machinery and processes involved in making twine from flax fiber. The writer says in that State flax is grown largely for the sake of the seed alone, tons upon tons of the fiber being burned for the mere purpose of getting rid of it. Doubtless, the same is the case in other States, East and West.

The same letter also alluded to the splendid advantages afforded for the profitable culture and refining of the amber variety of sugar cane in that State.

Persons who have never traveled over the great region which is usually spoken of as "The West," can have but little idea of the wonders that are to be wrought by the gradual filling up and development of these great States. Even now, cities which only a few years ago were mere villages, or Indian trading posts, contain active mechanical and mercantile establishments, whose productions and catalogues, issued for general circulation throughout the country, might well put many of our Eastern people to the blush.

Carelessness About Machinery.

Nearly all the accidents that happen to attendants about machinery can be traced directly to the carelessness or stupidity of some one. Accidents occurring in which no one is to blame are rare exceptions.

It frequently happens, however, that casualties take place which at first appear mysterious, but upon due consideration the facts are revealed enabling one to see clearly the true cause of the disaster. We can best illustrate some of these mysteries by recounting a few instances which have come under our observation. It is a common practice in some localities for a man to take out his license as an engineer, put another man (who is generally incompetent and always unable to pass an examination before a board of engineers) in his place, while he engages in some other business in which he can either make a commission or draw a salary, or both. We know of a number of instances of this kind.

If a belt comes off, the engineer being away, an inexperienced man has to perform the task. An instance of this kind occurred lately, where a young man in attempting to put on a large belt, stood upon the wrong side of the pulley. Before he was aware of the fact, the belt caught and drew his arm in between the belt and face of the pulley, actually tearing it from its socket at the shoulder, leaving him a cripple for life. If he had known enough to have placed himself upon the opposite side of the pulley, this terrible calamity could never have occurred.

In France there is a law in force which prohibits any inexperienced person from manipulating machinery, and until duly qualified they are not allowed under any circumstances whatever to meddle with machinery in motion. Why is it not so in this country? We have seen mere children with a piece of waste in their hands carelessly wiping the oil from the teeth of gearing, and we shuddered as we looked at them. The least false movement would have resulted in either instant death, or being made a cripple for life.

We have seen men fooling about an iron planer while in motion, and one case that happened in our presence was that of a man who persisted in keeping his tools inside the bed of the planer that he was running. He was also in the habit of reaching in for tools while the planer was at work. The result was that one day he kept his hand in there too long, and the table moving back caught his wrist, jamming it so badly that its usefulness was forever destroyed. Another case was that of an engineer, who was always in the habit of polishing up the connecting rod of his engine while in motion. One day his fingers were caught between the rod and crank, and crushed so as to render amputation necessary.

It is customary for some employers to take out licenses to run their engines, and then employ whomever they please to attend them. In one case of this kind the large engine in an establishment was run by an incompetent man, who was employed by the proprietor of the concern. The latter held a license to run the engine. Upon starting the engine one morning the crank caught upon the center; the engineer did not shut off the steam, but caught hold of the fly wheel and succeeded in starting it. He lost his balance and his body was jammed between the wheel and the side of the pit; his cries brought help to his assistance, the steam was shut off, and it required the united efforts of several men to extricate him from his terrible position. He was so badly injured, however, that he died shortly afterwards.

It is a frequent practice among experienced engineers to turn on steam when their engine is on or near the center, and then help the wheel by the application of the full strength of their muscles. They may escape ninety-nine times out of one hundred, but in the hundredth attempt they may get caught and sustain loss of life or limb.

We remember an engineer some time since who was employed as engineer for a large concern, and upon an inspection of the boiler found the bottom cracked and unsafe. This fact was reported to the proprietor who told the engineer that if he did not wish to use the boiler he would get another man, which he did. The boiler gave out in a few days so that a new sheet had to be put in. Much damage has been done through the employment of cheap help for responsible positions.

An engineer was running a large Corliss engine in a woolen mill, and drawing $1.87 per day for his services. The manager of the concern took an economical turn by discharging this engineer, and hiring an "apology" at $1.50 per day. The new man came on duty, and neglecting to put any oil in the cylinder, one of the composition valve stems stuck fast; and the new man, not knowing what was the matter, did not stop the engine until it was compelled to stop by the breaking of the wrist plate pins, and a general distortion of the valve gearing. During the excitement attending this occurrence no water was put into the boilers, and by the merest chance the low water was discovered by an outsider, just in time to avoid an explosion.

The engine was a 250 horse-power, having a condenser attached, and the new man, when questioned, confessed that he knew nothing of the condenser or the nature and uses of a vacuum, and yet he either carelessly or stupidly offered himself at low wages to jeopardize not only his own life, but also the lives of the hundreds of hands employed in the mill.

The cost of repairs rendered necessary to the engine was about $2,000, and the concern had sense enough left to discharge the "apology" and re-hire the engineer. It often requires these or similar experiences to teach concerns and individuals to be careful.

Literary Notes.

THE STEAM ENGINE AND ITS INVENTORS.—A Historical Sketch. By Robt. Galloway, Mining Engineer. 8vo., 260 pp. Macmillan & Co., 22 Bond street, New York.

The book bearing the above title is unlike other histories of the steam engine, which generally begin with the steam Æolipiles of Hero of Alexandria, Egypt, who flourished about 250 years B. C., including all the apparatus in which steam was used as a motive power down to the present day. The same ground has been gone over again and again by the ambitious historian. It would be a very difficult matter, indeed, to establish definitely the time and place when the power of steam was first discovered. But the object of the writer of this book (beginning with the first application of the cylinder and piston to produce power in the air pump of Otto von Guericke in 1654) is to advance step by step, including only those machines which have a direct relation to the cylinder and piston engine, which is the great prime mover of our time.

As has been herein intimated, this engine was not originally a steam engine at all, but from the application of the principles of the cylinder to pumps, for both air and water, which consumed power, it gradually passed through successive stages of improvement until the pressure of steam was finally applied to the piston, and in connection with other suitable mechanism used to develop power.

Great care has been taken in the preparation of the above book, and copious references are given to original publications and authorities, from whence the information was originally taken.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

NOTE.—Those who desire answers to questions must give their names and addresses or no notice will be taken of their communications. A great many anonymous letters are carefully deposited in the waste paper basket every day.

(1) J. C. B., Denver, Col., asks: When and where has the V tooth gear (shown herewith) been used and what advantages does it possess over the ordinary spur gearing? *A.*—The form of tooth mentioned by you is commonly known as the "herring bone" tooth, from its resemblance to the bones of a herring. The design is old and was at one time used extensively upon machine tools. The claims for this form of tooth are that by its use back-lash is prevented, also that the gearing works more smoothly. This is true when the gears are new and properly made. But when the teeth become badly worn, they will bear only in the center or angles, causing a tendency to push the gears apart, and necessarily creating an excessive friction upon the journals. We are acquainted with a manufacturing concern who used to apply the "herring bone" tooth to the racks of all their planers. The result was as stated, that the teeth worked well when new but after they became badly worn, the planer would not take a smooth cut, while the table would frequently be lifted from the slides. The foregoing reasons, and the fact that these gears were hard to make, caused this concern to abandon the tooth referred to. They have now adopted the best form of teeth known in spur gearing. This system was described in our issues of August 7th, 14th and 21st, 1880.

(2) J. H. V., Stanley, N. J., asks: Can you inform us of any solder, with which we can mend small cast iron (2 oz.) castings, with a heat that will mend hard solder? We find by using common solder, that the muriatic acid in a short time rusts under and lets the solder loose. *A.*—Clean the surfaces of the fracture with a file, then take a piece of wrought iron, and clean it also by filing. Place the wrought iron in the fracture, wire the parts together and braze with spelter solder, using borax as a flux in the usual way. This process, if properly carried out, will secure a joint which will not rust, and will be so strong that the casting will frequently break at other places, rather than at the former fracture.

(3.) E. A. C., Port Richmond, S. I.: Please settle the following argument between a friend and myself: In putting up a water-feed pipe for a boiler, which of the two valves must be on nearest the boiler, viz., the stop valve or the check valve. I claim the stop valve, because if anything happens to the check valve the water cannot be shut off by the stop valve in order to inspect the parts and ascertain what is the trouble with the check valve. My friend says this is not so, consequently I am wrong. We await your decision. *A.*—A stop valve should in all cases be placed upon the feed pipe, and as close to the boiler as possible. The chief object being to cover all valves behind it so that if anything happens to the check valve or any part of the pump, communication with the boiler can be shut off at once, allowing any necessary work to be done. We have known instances where the check valve has been next the boiler but such an arrangement is considered bad workmanship as the valve cannot be inspected should it become clogged or stuck.

(4.) C. E. M., St. Louis, Mo., asks: 1. Will the water in a boiler foam if the water is clean and pure? *A.*—Not in a well-proportioned boiler; but if a boiler has a poor circulation it is sure to prime, more particularly when the heat rises to a high temperature. 2. What other use is there for a check valve than to hold the water after it is once pumped into the boiler; and will a pump supply a boiler if the check valve next to the boiler is out, providing the valve next to the pump is in good condition? *A*—The object of a check valve is not only to hold the water from returning through the pipes, but is necessary to relieve the pressure, also lessen the wear and tear upon the valves of the pump. For other reasons see answer to previous question, No. 3, of this issue. A pump will, if in good order, supply a boiler without a check valve, but should any air get inside the pump it will be found very difficult, if not impossible, to start it. When a pump has to suck water it is necessary to have a pet cock in the pipe above the pump to allow the air to escape, in order that the water may enter.

(5.) J. G. B., Tremont, O., asks: 1. What is the effect in counterboring the cylinder of a steam engine? *A.*—Cylinders are counter-bored at each end a sufficient distance to allow the packing rings to wipe over the edges. This is done to prevent wearing of a shoulder in the bore, which would cause a disagreeable pound in the engine and develop other difficulties as well. 2. Is lime good to put on machinists' tools to prevent them from rusting; if not what is? *A.*—Lime is an excellent substance to put into a case where specimens of broken or fractured metal are kept, as it readily absorbs the dampness. Lime is also good to place in a room where finished tools or other work are stored, or are in cases for exhibition. But we would not recommend direct application to the surface of steel. We have always found a light coating of good clean sperm or lard oil equal to any emergency. If the tools are to be laid away they should be wrapped in oiled paper. 3. What is a good rule for ascertaining the power of a steam engine? *A.*—See answer to question 5, in our issue of Jan. 22, 1881.

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50 cts. a line for each insertion under this head.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

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J. C. Hoadley, Engineer and Expert, formerly of Lawrence, Mass., has opened an office at 29 High St., cor. Federal, Boston, Mass., where he will be pleased to receive old and new friends.

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MANUFACTURES.

The activity among manufacturers may be seen by the large number of boilers being built by Babcock & Wilcox, over 10,000 H. P. being now in hand. Their being booked as: Wm. Wallace & Sons, 400 H. P., 2d order; Lombard & Ayres, 90 H. P., 6th order; Jessup & Moore Paper Co., 250 H. P., 6th order; Singer Sewing Machine Co., 250 H. P., 19th order, goes far to explain how the aggregate of their business is made up.

The manufacturers of the Tabor indicator have recently received orders for indicators from the following well-known concerns: Cornell University, Stevens Institute and Thos. A. Edison of Menlo Park.

James Minter of Lowell has bought a lot of land on Union street, Worcester, Mass., and will erect a machine shop 100 by 45 feet, as soon as the weather will permit.

F. O'C. Robinson, an Englishman, who over a year ago purchased a mill site at San Antonio, Texas, has gone to his native land, with the intention of inducing a number of men experienced in cotton manufacture to return with him, and establish a co-operative company for the manufacture of cotton goods.—*Boston Commercial Bulletin.*

The Belcher & Taylor Agricultural Tool Company of Chicopee Falls, Mass., will begin preparations at once for the erection of a building 50 by 25 feet in size.

Webster & Chamberlin, Worcester, Mass., are building a number of electric engines, by which to supply electric lights for locomotives on a western railroad. About fifty locomotives are to be fitted with electric lights.

The Westinghouse Air Brake Co., of Pittsburgh, are experimenting with apparatus for electric locomotive headlights.

The Herreshoff Manufacturing Company, Bristol, R. I., are putting up a new machine shop, 66x30 feet.

The Pratt & Whitney Company, Hartford, Conn., have nearly completed their 140x40 feet (three story) addition to their shops.

The Niles Tool Works, Hamilton, O., are running 24 hours a day, and are pressed with orders for boring mills, radial drills, pulley machinery and other machine tools.

The Cope & Maxwell Manufacturing Company, Hamilton, O., have just issued an illustrated catalogue of their steam pumps and pumping machinery. They are crowded with orders for all classes of pumps from boiler feeders to large water-works engines. They find great difficulty in securing a sufficient number of good machinists.

The Youngstown *News* has every reason to believe that within the next few months that city will have one of the largest establishments for the manufacture of wagons in the state of Ohio.

A number of capitalists from Logan, with a capital of $25,000, are negotiating for a site at Portsmouth, O., for the building of a manufactory of firebrick works.

J. S. Worth, of the Coatesville (Pa.) Iron Company, is about to build a new rolling mill at that place, and the machinery is now being built.

A company for the manufacture of sewing machines, with a capital of $50,000 or $100,000, is projected at West Chester, Pa.

A new furniture company has been organized at Grand Rapids, Mich., with a capital of $30,000. The name of the new establishment will be "The Valley City Manufacturing Company," the purpose being the manufacture of the medium and cheapest grades of furniture, packing boxes, etc.

The Wagner Palace Car Company is, it is understood, to give a thorough test to a newly-patented car wheel, which is provided with a rubber belt between the wheel and the tire, and will, it is claimed, prevent the frequent breaks which occur in consequence of wheels striking the frogs.—*National Car Builder.*

The Russell Manufacturing Company will build another large factory at Middletown, Conn., the coming spring. It will be of brick, four stories high, forty by ninety feet upon the ground.

There is talk of working Sayles' emery mine at Adams, Mass., and it is said that a company with $12,000 capital will begin operations in the spring.

The Boott Cotton Mills of Lowell, Mass., are about to put in a Porter-Allen high-speed engine of great power.

P. C. Holmes & Co., Gardiner, Me., make a specialty of gears. They will soon add one or two new buildings to their works.

Wm. Tod & Co., Youngstown, Ohio, are running full on stationary engines, blast furnace work and blowing engines. Their foundry has facilities for turning out single castings up to forty tons.

The Stiles & Parker Press Co., Middletown, Conn., write us:

Business is still driving us. The addition we put up last summer is full to overflowing. Inquiries and orders are coming in this month faster than for several months past.

The Yale Lock Company, of Stamford, Conn., have voted to increase their capital stock and add to their buildings.

Machinists' and Engineers' Supplies.

The firm of Barker & Berton, 422 East 23d St., New York, has been dissolved by mutual consent. Mr. Charles A. Berton retains the agency for the Jarvis Furnace at the same location.

Kingsbury & Draper, 53 East Third St., St. Paul, Minn., have issued an 1881 Illustrated Price List of Tools for Carpenters, Machinists, Cabinet-Makers, Carvers, Pattern-Makers, Moulders and Amateurs. The book is handsomely and creditably gotten up, and comprises a large variety of tools for the classes of mechanics named.

We have received a copy of the new illustrated catalogue of machinists tools made by F. E. Reed, Worcester, Mass. It is in pocket form and gives prices in every instance.

Iron and Metal Review.

Pig iron is listless, in a measure. Brokers have very little to do in American pig, most of the sales apparently being made from furnaces. No. 1 Foundry, $25 to $26; No, 2, $22 to $23; Gray Forge $20 to $21; Scotch Pig is sold in a regular way at $24 50 to $25 for Coltness; $22 for Eglinton and $23 to $23.50 for Glengarnock, Gartscherre and Carnbroe. No. 1 Wrought Scrap is in good demand at $30 from yard. Bar iron from store sells steadily on a basis of 25c. for refined. Ingot Copper sells at 19¼c. for lake and 18¾c. for Baltimore. Tin has an upward tendency at 19¾c. to 20¼c. for Straits, Australian and Billiton. Lead is dull at 4⅞c. to 5c. for refined. Spelter is also dull and selling at about 5⅜c. to 5¼c. for Silesian and 5c. to 5⅛c. for Domestic. Sheet Zinc, 7c.; Antimony, 14½c. to 15c.

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Wanted, Foreman for Machine Shop. Thorough mechanic competent to manage men. Satisfactory references required. Address B. W. Payne & Sons, Corning, N. Y.

Wanted.—By a graduate of the Scientific School at an eastern college, who has had practical experience in machine design, a situation as draughtsman and designer. Good references. Address, Draughtsman, P. O. Drawer 38, New Haven, Conn.

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Wanted.—A thoroughly competent man as Superintendent of the Novelty Iron Works, Cleveland, O. 100 men. Manufacture machinery, bridge-work, &c.

Wanted.—A Foreman Moulder for foundry, where large castings for steam engines, etc., are made. Apply by letter to "109," office American Machinist.

Wanted.—A competent draughtsman, machinist and tool maker desires an engagement; is a first-class workman both on fine tools and machine work. Address Machinist Box 55, New Haven, Conn.

Wanted—Foreman capable of laying out marine and general work. Good situation to steady man; must come well recommended. Chicago Steam Boiler Works, 66 to 72 Michigan St., Chicago, Ill.

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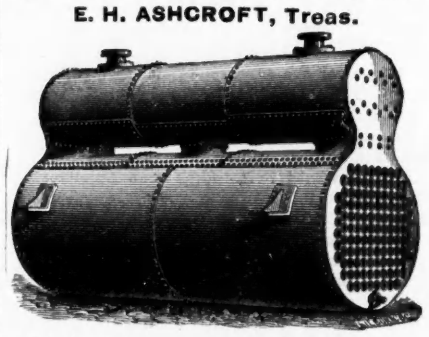

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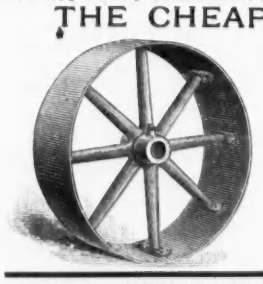

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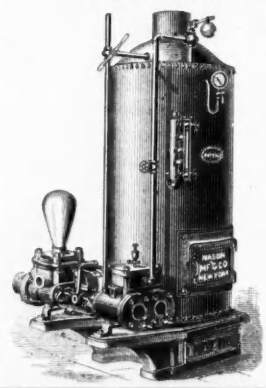

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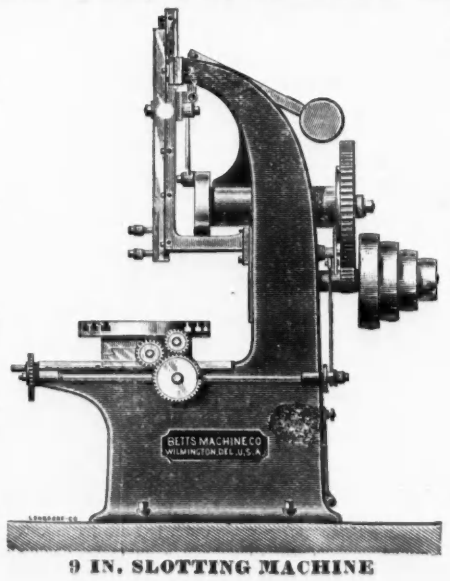

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